4. PRELIMINARY DESIGN AND FACILITY DESCRIPTIONS

4.1 General Site and Utilities

4.1.1 Alternatives Examined

Three sites were investigated during the selection process. The criteria used for selection and the results of the study are documented in EDF-1548, *SSSTF Siting Study* [19].

4.1.2 Selected Approach

4.1.2.1 General. The SSSTF will be located adjacent to the INTEC site at the INEEL. The facility will be sited south of the existing electrical substation and the proposed service waste discharge lines to percolation ponds. Overall facility orientation will facilitate future expansion of facility structures. The site will be developed to allow for sufficient vehicle parking and circulation. Segregation will be maintained between the light vehicle traffic of the administrative/office area and the heavy traffic of the operational activities related to the staging /treatment areas(see project plans for the site layout).

Surveying and a subsurface investigation of the site will be conducted prior to the 90% design work. The site will be stripped of existing vegetation and then filled and graded for the new building, access roads, service areas, and parking lot. Areas to be occupied by the buildings will be raised in relationship to surrounding ground elevations to provide drainage away from the building foundations and entrance sidewalks. Grade changes at the main entrance to the administration building will be kept to a minimum to permit handicapped personnel and vehicle accessibility. Site surface drainage will be coordinated with existing physical structures and future buildings and planned activities of the surrounding area.

Existing INTEC water and sewer utilities will be extended to service the new facility. Potable water will be provided for personnel drinking and sanitary uses. Firewater will be provided for the building fire-extinguishing system via a looped water supply. The treatment and decontamination facilities will be supplied raw water for their various functions.

Vehicle access will include paved access, exit and service roads, parking areas, and staging areas. The staging area will be sized for receiving waste transport vehicles servicing the staging/ treatment facility.

4.1.2.2 Surface Drainage. The topography in the proposed area for the SSSTF is relatively level. Surface drainage will be diverted to the vacant areas surrounding the buildings, providing excellent drainage away from the facility.

4.1.2.3 Rock Excavation. A geotechnical investigation will be conducted during the title design to determine bedrock elevation, final foundation design, and finish floor grade. Excavation of rock is not anticipated for the installation of underground utilities or for the building foundation.

4.1.2.4 Soil Excavation. The site will be stripped of existing vegetation and graded in all areas where the building, parking area, access road, and landscaping are to be installed.

Soil excavation will be required for the installation of underground utilities and the construction of the building foundation. Soil excavation for the foundation will be minimal. Required fill material will be supplied by the excavation activities of the evaporation pond construction preceding construction of

the SSSTF. Bedrock is estimated to be well below the excavation depth required for this project based on rock probes for the new service lines.

Space is available for the backsloping of the majority of all required excavations. Soil compaction will be required to meet 95% maximum density for all embankments, backfill, subgrade, and base courses under building floor slabs and pavement.

4.1.2.5 Finish Grading and Landscaping. The final finish floor elevation will be determined during 90% design. It will be established approximately one foot above the graded surface.

New asphalt concrete access roads will be provided as shown on the Site Plan for the new facility (see the project plans for details). Asphalt paving will also be provided to facilitate personnel parking and delivery vehicles.

Reinforced-concrete sidewalks, door stoops, and approaches will be provided to facilitate personnel access to the facility. Provisions for the safe entry to the facility by handicapped will be provided. Guard posts will be provided at the staging area for protection from service vehicle activity. Building utility and equipment slabs will also be reinforced concrete and sized appropriately.

The feasibility of landscaping areas immediately adjacent to and surrounding the administrative areas should be considered.. Adjacent areas not paved but disturbed during construction will be seeded with dryland grass compatible with seed mixtures developed for the INEEL.

4.1.2.6 Underground Utilities. The utilities for the SSSTF will be supplied from existing services within the INTEC plant. Coordination will be required between the INTEC landlord, security personnel, and communication personnel when excavation for the utilities occurs within the INTEC security zone and across the perimeter security fence (see the project plans for details).

A new 2-in. pressure sanitary sewer line will be routed from the new facility, via a grinder pump, to an existing sanitary sewer manhole in the INTEC wastewater collection system.

Potable water will be supplied to the SSSTF by a 4-in line that will be tied into an existing INTEC 3-in potable water line. All potable water lines will be buried a minimum depth of 6-ft below grade. There will be a 10-ft clear zone minimum between the potable water and the sanitary sewer.

A new 6-in. raw water line will be provided to the SSSTF by tying into the existing INTEC raw water system.

4.1.3 Major Equipment Description

Two grinder pumps in a lift station for the sanitary sewer will be required.

4.2 Administrative Facility

4.2.1 Alternatives Examined

Alternatives for various types of construction have been identified. The Cost benefit and Life Cycle Analysis have not been completed at the time of this submittal. This analysis will be completed as part of the 90% design process (see Section 5). The concept described in the following paragraphs is provided for establishing a 30% design baseline and is based on historical projects at this location.

4.2.2 Selected Approach

4.2.2.1 Administrative Office Area. An office area will accommodate the administrative activities of a limited number of office personnel and a commons area will be provided for the operational personnel to participate in required work activities. The common area will serve as a training room to conduct classroom training, a break room, and as an area for conducting planning functions. Space will be provided for office machines and supplies. Square footage for the allowed office areas will follow the General Services Administration (GSA) standards.

4.2.2.2 Public Use Area. An area will be provided for personnel interfacing with the operational and administrative personnel of this facility. This area will also be used as a conference room.

4.2.2.3 Document Storage Room. An area will be provided for storage and protection of waste manifests and waste tracking documents.

4.2.2.4 Public/Office Restrooms Area. Accessible restrooms will be provided. The number of fixtures will meet the minimum required in accordance with the UBC and Uniform Plumbing Code (UPC). A small janitors closet with a sink and storage space will be provided.

4.2.2.5 Operational Personnel Areas. Shower, change, and restroom areas will be provided for the operational personnel performing operational activities beyond the treatment process.

4.2.2.6 Utility Rooms. Separate rooms will be provided for the service utility and equipment supporting the facility, such as heating and air conditioning equipment, fire riser, electrical panels, and communication equipment. The individual rooms will be sized as needed to support the equipment required for each utility.

4.2.2.7 Structural. The administrative facility and enclosed storage area will be engineered metal building structures with cast-in-place concrete foundations, and concrete floor slabs. The roof shall be a standing seam, metal roof (see project plans). Framing, in building areas, will be steel columns and beams. Intermediate columns will be used where possible to minimize frame sizes.

4.2.2.8 HVAC. The HVAC for the Administration Building is to be for personnel comfort with the design criteria per the Architectural Engineering Standards and ASHRAE 62-89 (for the fresh air supply).

4.2.2.9 Utilities. Potable water and sanitary sewer shall be supplied from existing services within the INTEC plant. Hot and cold water will be available.

4.2.3 Major Equipment Description

SSSTF/ICDF Tracking System

As waste is processed through the SSSTF and into the landfill, a waste tracking system will be necessary. This tracking system will serve several purposes. It will permit the waste generator to submit a request to send waste to the ICDF. As part of this request, the generator will submit the waste profile. From the profile, a determination can be made by ICDF operations as to whether the waste meets the acceptance criteria of the SSSTF and landfill of the ICDF. This portion of the process will be accomplished electronically. Once ICDF operations have determined that the waste meets acceptance criteria, the waste units can be assigned an identification (ID). This will be in the form of a barcode and associated ID number that will be printed on a paper copy of the Waste Profile Sheet. The ID will follow the waste unit through the SSSTF and into the landfill. The units may go directly to the landfill or they

may be processed through the stabilization process. As the units travel through the SSSTF and into the ICDF, a log will be recorded of actions taken in the processing of the waste unit. Finally, location coordinates of the waste units in the landfill will be entered into the ICDF database.

The tracking system will have several key features. While a hard copy of the waste profile sheet will likely be generated and accompany each waste unit to the SSSTF, all of the required data will be entered electronically and processed real-time via a wireless Local Area Network (LAN) to a local server. Hand-held units will be used for this data entry. Another key feature of the tracking system will be security. Only authorized personnel will be permitted to make data entries. Once entered into the tracking system, data associated with a waste unit can only be changed by a limited number of personnel. Even then, changes will be logged. With the waste unit processed through the ICDF, all required information for the unit will be recorded in the ICDF database. When the need arises, these data can be readily retrieved. In addition, these data can be accessed to complete reports which may address total volumes, contents, or other requested information.

While private companies offer tracking systems that can be tailored to the above process, the SSSTF design team will likely recommend that an existing system developed within the DOE complex be used for tracking. This existing system will have to be modified for the unique requirements of ICDF; however, it already has all the features mentioned above.

SSSTF Fire Alarm System

There will be a fire alarm system installed in the administration, treatment, and decontamination buildings that will be built using a fire alarm control panel located at the entrance to the building. Input signals from Initiation Device Circuits to the fire alarm control panel will be from manual fire alarm stations located at each of the building exits and a fire sprinkler system water flow signal located at the fire sprinkler system riser. There will be a supervisory signal from the fire sprinkler system control valve indicating if the valve is open or closed. Output signals to the occupant notification appliance circuits will be provided for each of the input fire alarm signals. The occupant notification appliances will be a combination horn (standard fire alarm signal) and flashing strobe, which are compliant with the Americans with Disabilities Act (ADA). The fire alarm output signals will be transmitted to the INEEL Proprietary Fire Alarm System over telephone circuits and by means of a Digital Alarm Communications Transmitter (DACT). All alarm signals will be received at CFA 681 by a Digital Alarm Communications Receiver (DACR) and retransmitted through the INEEL Proprietary Fire Alarm system to the Fire Department Dispatcher.

Emergency Notification System

There will be an Emergency Notification System (ENS) installed in the administration building that will consist of a control (amplifier, tone generator) panel located near the building entry, ceiling-mounted speakers throughout the building, and a microphone input located at the control panel. Notice of an emergency will be by 'D' net radio message from the Warning Communications Center (WCC).

4.3 Staging Facility

4.3.1 Staging Areas Provided

Upon entering the fenced area of the SSSTF, paperwork shipped with a load of waste will be checked and verified, the load will be weighed and if necessary will be parked in a holding area. Waste not matching the profile and criteria will be held until proper disposition is determined.

Upon verification, the load of waste will be taken directly to the landfill if treatment is not required, or to the treatment facility if treatment is required. A concrete staging pad will be provided for waste that cannot be treated immediately. This pad will be large enough to accommodate 28-13 yd^3 roll-on/roll-off containers. Staging and storage area sizing requirements are provided in EDF 1545 (see Reference 16).

After treatment, the treated waste will then be placed in roll-on/roll-off containers. The treated waste will be sampled. Samples will be sent to the laboratory for a Toxicity Characteristic Leaching Procedure (TCLP) testing. All of the treated loads will be held in an outside storage area while waiting for the sample test results. A concrete staging pad large enough to accommodate 42-13 yd^3 is being provided

Waste passing the TCLP will be hauled to and disposed of in the landfill. Waste which does not pass the TCLP will be returned to the treatment facility for additional treatment and stabilization.

A concrete pad is also being provide for empty roll-on/roll-off containers or contingency staging as may be required. This pad will hold 20 roll-on/roll-off.

4.3.2 Selected Staging

A small self-contained storage building will be reserved for waste with PCB's greater than 50 ppm if waste with this concentration should come to the SSSTF. This building will be in compliance with the Toxic Substance Control Act (TSCA) as defined in 40 CFR 761 for PCBs. From here, the PCB waste will be packaged and held temporarily for the Waste Generator Services (WGS) repossession and final disposition either on-Site or to an off-Site facility.

Should staging be required for special wastes not meeting the ICDF Complex WAC's , they will be evaluated administratively and handled on a case-by-case basis. They may be staged in the contingency area as may be required.

4.4 Waste Treatment Facility

The majority of the waste identified for stabilization is soil contaminated with cadmium, chromium, lead, mercury, and silver. The stabilization process combines reagents with the waste via a mixing function to chemically fix the contaminants prior to disposal to the ICDF. Based on a consensus alternative decision evaluation, the mechanical system chosen for implementing the stabilization process is a mixing basin approach similar to commercial practice but using controlled operations within a confinement structure.

A total of 35,765 yd^3 of non-aqueous waste has been identified for stabilization. The stabilized waste output will depend on actual waste loading of the wastes in the total output volume (amount of reagents required). Stabilization of the input will result in output volume increases of approximately 39,738 yd^3 of stabilized mixture delivered to the ICDF based on a 90% waste loading; 47,687 yd^3 for a 75% waste loading; and 71,530 yd^3 for a 50% waste loading. Actual waste loading and output volumes may vary depending on waste stream contaminants and concentrations and will reflect final recipe formulations determined during treatability studies.

The design basis waste loading is 75% that will result in an output of 47,687 yd^3 to the ICDF.

4.4.1 Alternatives Examined

Four systems have been considered for evaluation which meet the above requirements and minimum criteria. The decision analysis evaluation, as presented in Appendix C of EDF-1542, *Stabilization Treatment Process Selection* (see Reference 17), of these systems highlights issues relevant to the implementation of the SSSTF stabilization process capability. For the purposes of the evaluation, the assumption was made that all four alternatives will have some type of primary dust suppression enclosure, which will be an environmental enclosure only. These systems are described as System Alternatives 1, 2, 3, and 4 below.

System Alternative 1: Pug Mill System

The pug mill system is a continuous multi-functional system comprising multiple components with each component functionally specialized. Components include:

- In-Feed Roll-On/Roll-Off – Although the soil is assumed to not contain any material greater than 5 in., it will still be screened prior to being discharged into the mixing system.

- Screen –The waste from the roll-off would be discharged onto a screen. Large material not passing through the screen would be directed into another container to be treated as debris. The screen may need to vibrate to segregate materials.

- Bin – The material that passed through the screen would then be discharged into the staging bin prior to mixing. Soil will be continuously discharged from the staging bin into the pug mill.

- Mister – A mister will be used to keep dust levels at acceptable levels during the mixing operation by keeping the soil moist.

- Mixing Unit – The pug mill is a continuous feed system that will receive waste and reagents at specified rates and mix waste and reagents using paddles that rotate inside the pug mill.

- Discharge Unit – The pug mill will discharge into the roll-on / roll-off container on the waiting truck. When the truck is full the treated soil discharging from the pug mill will be sent to a surge bin until a new truck and roll-on/roll-off container can be moved in to collect the treated soil.

System Alternative 2: Concrete Mixer

The concrete mixer system is similar to the pug mill except that it is a batch system with no interior moving parts. The paddles are affixed to the interior of the mixer and the entire mixer rotates. The components of the cement/concrete mixer system include:

- In-Feed Roll-On/Roll-Off – Although the soil is assumed to not contain any material greater than 5 in., it will still be screened prior to being discharged into the mixing system.

- Screen –The waste from the roll-off would be discharged onto a screen. Large material not passing through the screen would be directed into another container to be treated as debris. The screen may need to vibrate to segregate material.

- Bin – The material that passes through the screen would then be split into two bins and treated as separate batches.

- Gate – Gates will be located on each bin to discharge a batch into the mixer with the reagents. Multiple batches may be required for each roll-on/roll-off container.

- Mister - A mister will be used to keep dust levels at acceptable levels during the mixing operation by keeping the soil moist.

- Rotary Concrete Mixer – This type of mixer has paddles that are fixed to the interior of the mixing drum. The drum is rotated using gears on the outside that are easily maintainable. There are no moving parts inside the drum.

- Out-Feed – After a batch has been sufficiently mixed the drum will be rotated and the treated soil will be dumped into a waiting roll-on/roll-off container.

System Alternative 3: Komar Shredder-Mixer

The Komar Shredder-Mixer is a multi-functional system with custom-built equipment capable of performing size reduction, material conveyance, and mixing/blending within one basic unit (that is an auger type shredder/blender system).

- In-Feed Roll-On/Roll-Off – The soil is assumed to not contain any material greater than 5 in.; it will be directly discharged into a split staging bin.

- Bin – The soil will be split into multiple bins and treated as separate batches.

- Gate – Gates will be located on each bin to discharge each batch into the process hopper with the reagents.

- Process Hopper – The process hopper receives the soil and reagents and is located on top of the mixer-shredder.

- Mister – A mister will be used to keep dust levels at acceptable levels during the mixing operation by keeping the soil moist.

- Komar Mixer-Shredder – This type of mixer is a very powerful dual auger system that will mix and shred most materials. Oversized material will be crushed/shredded by the shredder/mixer.

- Out-Feed – As the soil and reagents are mixed and shredded, the treated soil will be directly discharged into a waiting roll-on/roll-off container.

System Alternative 4: Mixing Basin

The mixing basin system is a custom-designed facility structure combined with commercial material handling equipment for segregation, mixing, and loading (the basin and articulated arm with end effector concept).

- In-Feed Roll-On/Roll-Off – The will be directly discharged into the mixing basin.

- Steel-Lined Basin – The mixing basin will be large enough to accommodate approximately 26 yd^3 of waste and will be lined with steel plating.

- Reagent Additives – The proper volume of reagents will be added in the mixing basin via conveyors, chutes, or pipes.

- Mister – A mister will be used to keep dust levels at acceptable levels during the mixing operation by keeping the soil moist.

- Backhoe (Hydraulic Articulated Arm) – A skilled operator will conduct the mixing of the soil and reagents using a hydraulic articulated arm.

- Interface on Outlet – After the soil has been treated it will be loaded directly into empty roll-on/roll-off containers using the hydraulic articulated arm.

4.4.2 Selected Approach

Following the input of the decision analysis data into the DecisionPlus™ software program, Alternative #4, mixing basins, received the highest score and is the recommendation for implementation of the stabilization process in the 30% design. The scoring results with highlighted basis considerations are shown on the decision analysis diagram in EDF-1542, Appendix C, Figure C-1 (see Reference 17) and were based on group discussion with consensus conclusions. The Mixing Basins scored slightly higher than the Concrete Mixer followed by the Komar Shredder-Mixer and the Pug Mill. Prior to commencing 90% design it is suggested that confirmation of possible mitigating issues be investigated to assure or confirm the results of this evaluation. There are some factors that clearly require additional research before the alternative selected moves into final design stages. Those factors or mitigating issues should include thorough review of operational radiological hazards for the wastes planned for treatment, formal cost estimate comparisons between the alternatives, detailed investigation into throughput capabilities for each alternative, and a review of operational limitations for each alternative. If it is apparent that the confirmatory investigations contradict the results of this evaluation, a new evaluation should be held with potential title design re-scoping efforts to follow.

4.4.3 Major Equipment Description

Figure 4-1 provides a high-level process flow diagram for the SSSTF stabilization process. Various combinations of additives and reagents may be utilized within the process including, but not limited to, portland cement (PC)/flyash, PC/lime, PC/flyash/blast furnace slag both air and water cooled, PC/flyash/blast furnace slag/clay, etc. Actual combinations and recipe formulations are determined during treatability testing of the various soil types and the contaminants to be stabilized. The process includes the following major equipment components or facility areas:

- Raw material unloading station

- Bulk reagent bins (PC, blast furnace slag, flyash, etc.)

- Pre-mix bin

- Dry and liquid additive bins or tanks

- Waste water tank(s) and piping

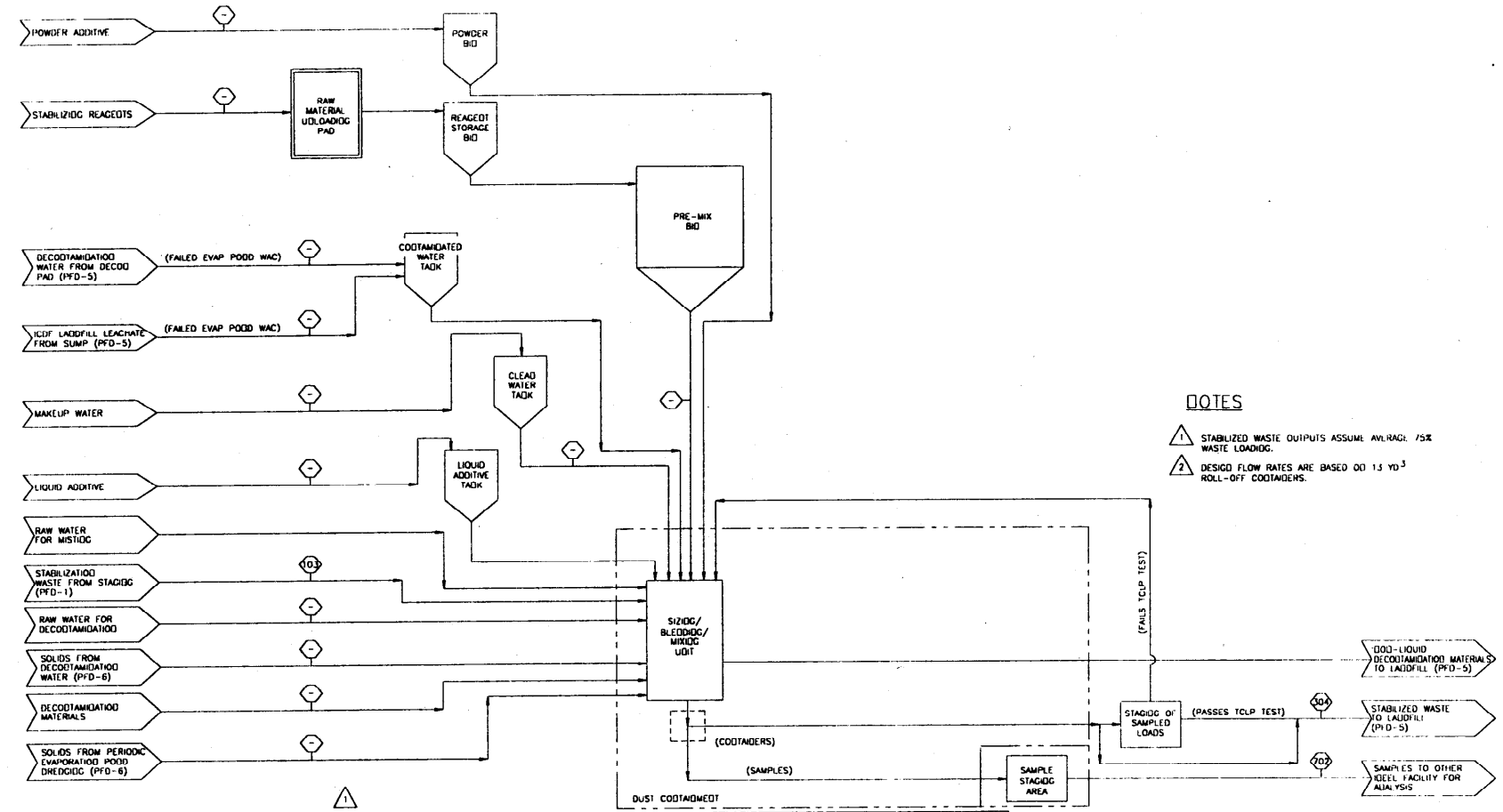
- Waste container unloading station
- Blender/mixer unit
- Container fill station
- Stabilized material containers
- Container staging station
- Product sample station
- Product sample transfer station
- Process confinement providing for dust suppression system(s), and a physical structure utilized in conjunction with filtered ventilation air
- Decontamination and washdown systems
- Process interfaces for waste form packaging/loading
- Associated process material transfer equipment.

4.4.4 Treatability Study

A PC-based media will be used to treat and stabilize the waste. A treatability study will be performed and will utilize surrogate waste composed of a representative soil spiked with leachable forms of heavy metals. A single "worst-case" surrogate material will be prepared. The heavy metal content for each particular metal in the surrogate will be based on the maximum expected heavy metal level among the targeted waste sites. The purpose for using a surrogate is to establish a baseline treatment recipe, which will be used as a starting recipe for studies on the actual wastes.

4.4.5 Verification Testing

Following the treatability study, individual waste site RD/RA Work Plans proposing soil disposition at the ICDF will require characterization and profiling of the waste materials. If characterization results indicate the waste may be potentially hazardous, a TCLP analysis will be conducted to determine whether the waste requires stabilization prior to disposal in the ICDF. If stabilization is necessary, the responsible waste site RA manager will provide the SSSTF a composite, representative, and homogenous sample. The waste loading (WL) and CFS baseline formula developed in the treatability study will be the starting point for formulations and verification testing for each site. If the WL and CFS formula are verified, the WL will be increased until the maximum WL limit is determined. If the treated waste fails at the baseline values, the WL will be decreased in a similar manner.



PROCESS STREAM	103	105	304	702	-	-	-	-										
DESCRIPTION	STABILIZATION WASTE		STABILIZED WASTE	SAMPLES														
FLOW RATE, MAX (YD3/YR)	11,110		14,813															
FLOW RATE, DESIGN (CONTAINERS/HR) 2	1.0		1.0															
FLOW RATE, DESIGN (GPH)	-		-	-														
VOLUME, TOT (YD3)	35,765		47,687															
VOLUME, TOT (GAL)	-		-	-														

Figure 4-1. Waste Treatment Process.

4.5 Decontamination Facility

4.5.1 Selected Approach

The decontamination facility is a building located near the exit to the ICDF Landfill for the decontamination of trucks and equipment. Trucks will deliver emptied roll-on/roll-off from the treatment building to the decontamination station. A high-pressure water sprayer will be used to wash the containers. After decontamination, the containers will be stored at the empty container storage pad until they are required, or returned to the waste generator. Equipment and trucks will be decontaminated to eliminate any external radiological contamination prior to leaving the SSSTF. Any equipment that has not been decontaminated and is no longer in use will be stored in a contaminated equipment storage area. Decontamination wash-waters will drain to a lift station located adjacent to the decontamination building and pumped directly to the evaporation pond.

4.5.2 Major Equipment Description

Oil/water separator and fines filters shall be provided for filtering the decontamination wash-water before the water is released to the evaporation pond.